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About the Cover

The X-15 was a major contributor to man's advancement of aircraft technology in a long series of research aircraft. The first, the X-1, brought about the long-awaited breakthrough, achieving supersonic flight.

The X-15 was a rocket-powered aircraft, 50-feet long with a wingspan of 22 feet. It was missile-shaped with a wedge-shaped vertical tail, thin stubby wings, and unique side fairings that extended along the side of the fuselage. Weighing 14,000 pounds empty and 34,000 pounds at launch, the vehicle was capable of developing 57,000 pounds of thrust.

Because of the large fuel consumption, the X-15 was air-launched from a B-52 aircraft at 45,000 feet at a speed of 500 miles per hour. Depending on the mission, the rocket engine provided thrust for the first 80 to 120 seconds of flight. The remainder of the normal 10-11 minute flight ended with a 200 miles per hour, glide landing.

First flown in 1959, a total of 199 flights were made, providing data on aerodynamics, flight controls, and the physiological aspects of high speed and high altitude flight. Record altitudes and speeds up to 354,000 feet and 4,520 miles per hour were obtained before the last X-15 flight on Oct. 24, 1968.

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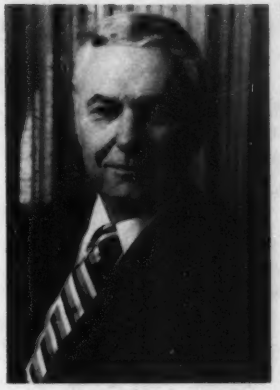
Administrator's Column

(In this column, NASA Activities features an article by NASA Administrator James M. Beggs. These articles focus on subjects chosen by him that address topics of broad interest to the agency's employees. The column this month features an address presented to the Second Annual Contractor's Conference at the Marshall Space Flight Center, Huntsville, Ala.)



Quality And Productivity Is Our Goal

I am very pleased to see this growing interest in achieving higher contractor/NASA team quality and productivity.

This second annual contractor's conference is unique to government. Other agencies probably have gone out and asked their contractors how to make their job easier. But none have deliberately gone back and reported its progress. Two NASA centers, Johnson and Marshall, have gone even one step further—they worked with their contractors to develop a productivity implementation plan to make them even more responsive.

But let us not fool ourselves, we are dealing with complex issues that require a great deal of thought to formulate effective implementation plans. We must continually remind ourselves of our objective—to bring performance and quality to world class competitive levels. Nothing less will suffice these days.

All of society is concerned and disturbed about our national level of quality and productivity. Government and industry have a special obligation to alleviate this concern. As a team, we have a huge stake in helping to improve the situation. Our budgets are tight and our image precarious. We have the opportunity to provide leadership because of our history of excellence. We have committed ourselves to do so. I am encouraged by your presence and the growing number of initiatives that you have taken, and I am pleased that you also share our commitment.

It's clear that NASA's role in driving new technology lets us exert a degree of influence out of proportion to our size or funding. The word is leverage. Today's technical and management challenges underscore the fact that NASA must continue to use that leverage in ways that will foster improved national capabilities. Indeed, our challenge is to manage, motivate and create an environment for our employees in which they give the best that is in them: in performance, in creative ideas, in dedication and in skills.

More that 200 years ago, Lord Chesterfield, in a letter to his son, put that challenge this way: "Aim at perfection in everything, though in most things it is unattainable; however, they who aim at it, and persevere, will come much nearer to it than those whose laziness and despondency make them give up as unattainable."

Our aim is to come as near to perfect as we can in all we do and all we produce. For NASA, this means better training of both workers and managers. It means reshaping attitudes so that all employees can be part, indeed, part of the action. It means stressing innovation, and looking for ways to streamline our management processes. And it means placing the highest priority on quality and productivity improvement. Today, we are doing all of those things and more.

As the Japanese and others produce higher quality goods and carve even bigger niches in American markets, our emphasis on excellence is more important than ever. The real measure of our performance is productivity growth. Here our annual growth rates, while recently advancing at about 3 per cent, still do not measure up to Japan's 6 per cent, for example; or to West Germany's 4.5 per cent or to France's 4 per cent. Unless we can show an ability for productivity growth that is competitive worldwide for the long term, we will continue to lose ground to others.

I believe that economic growth and prosperity only can be sustained for the long term by improvements in productivity and quality. Such improvements will be fundamental in helping to restore America's competitive strength in the world. And they will shape our economic future over the remainder of this century and well into the next.

This is a nationwide challenge. A couple of years ago we decided that NASA has a special role in helping to meet it, because, for most Americans, NASA epitomizes excellence. Indeed, for more that 26 years NASA has stood for what is best about America—technology leadership, management innovation and a can-do spirit that demonstrates that nothing is impossible if we apply teamwork, commitment for success, and remain open to ideas for improvement.

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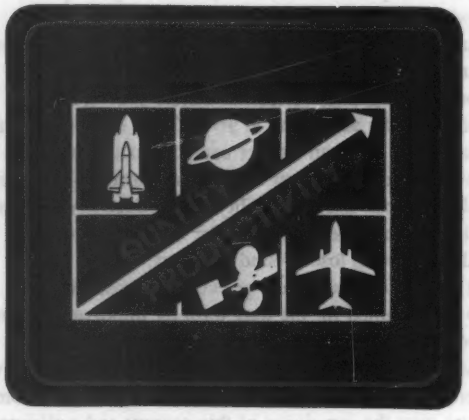
So, we decided that NASA would help get America back on the competitive track by spearheading a drive to restore national excellence through improvements in quality and productivity.

We started with our own organization. After all, Mark Twain once wrote, "few things are harder to put up with than the annoyance of a good example."

Looking at it that way, we'll be very pleased if our program becomes a major national annoyance. And if it does, we will be proud to take the credit for helping to get American industry on the winning track again.

Recently we established a permanent office of NASA productivity programs. We issued policy statements to ensure NASA's leadership in the development and application of advanced technology and management practices which contribute to both agency and national productivity. Our policy states that we will provide a participative and challenging environment for all employees, so that they have the opportunity to perform the best job they can and be involved in the organization's success. It commits NASA to develop a team approach with its contractors and support modernization and high quality as a philosophy both internally and externally, to achieve the highest levels of quality and productivity.



NASA Productivity Office emblem

Our NASA corporate policy is based on the philosophy that reflects the basic principles of participative management—respect for the individual and a belief that decentralized decision-making and the team approach to problem solving encourage innovation and reveal talent which otherwise might go untapped.

Our goal is to motivate all team members: NASA and contractor employees, from top managers on down, to participate in improving overall performance. Every employee must feel that he or she has a stake in making the system work better. Because only through participation across the board can we achieve higher quality products and greater individual and institutional performance in what we do.

The foundation upon which we are building to improve performance and revitalize our organization is in a document called "NASA Management Principles to Achieve Excellence." These principles are our 13 commandments, they embody our basic beliefs, our commitments and our motives. They also exemplify the best of the NASA culture for the first 26 years. Following these principles has allowed the agency to be managed so successfully over the years to make the impossible possible.

With many recent retirements in the agency work force, we wanted to assure that these principles for achieving excellence, which have brought proven success, were handed down to succeeding generations of employees as they came onboard. A copy has been sent to each employee in the agency. We are not leaving management training to chance. The principles are being incorporated into training programs. And they have been used, more importantly, to assess the effectiveness of the present day organizations by top and middle management.

We recently took a good look at ourselves in light of these principles. And we found some agency impediments to quality and productivity. As a result of this review, we are focusing on three areas—modernization, reducing the bureaucracy and further delegating authority down to the lowest practicable level to increase individual motivation, initiative and creativity. Our productivity steering committee has met to identify steps for long-term, continuous improvements.

Shakespeare wrote: "No perfection is so absolute that some impurity doth not pollute." None of us are perfect. But we'll do all we can to aim to be.

I am here today to reinforce a commitment to you. It is that we intend to do everything we can to work with you to ensure excellence in all that you do for us. The aerospace industry is under fire these days. Many are questioning its integrity in conducting government work. Together, we can help turn this situation.

We need to reinforce a management style that encourages our employees—contractors and staffers alike—to make suggestions for continuous improvements. We are beginning to see this happen in concrete ways in a few centers. Contractors are proposing the establishment of suggestion programs, particularly in the major hardware contracts. Another example is occuring with NASA employee teams and quality circles. The sessions are well organized and well attended. Many contractor employees come. The

sessions are proving to be effective tools for quality improvements at all levels! Another idea receiving attention is the assignment on major contracts of full time quality and productivity managers to encourage improvements. This is an area that deserves as much attention as schedules and resources.

Last fall, NASA sponsored a symposium of high level leaders from some of the most successful organizations in the country. These leaders discussed the reasons the United States has lost some of its competitive clout in the world. They also talked about their respective approaches to enhancing productivity. A recurring theme throughout the symposium was that improvements in quality lead to high productivity and reduced costs. In many organizations, total defect costs range from 15 to 40 per cent of budgets. For maximum organizational effectiveness, continuous improvement goals are needed. And management must be totally committed to them.

Clearly, management needs to encourage innovation and improvement and create an environment that rewards and supports it. Maintaining the creative and quality attitude makes an organization successful. We have seen that the vigor of successful corporations comes from very high levels of performance "over and above" that are normally expected. To build dedication, pride and team effort, management needs to encourage and provide positive support for employee participation.

We also have seen that as successful organizations mature, they tend to become bogged down with controls and rules that are stifling and inflexible. They lose their ability to take the kinds of risks that made the organizations successful in the first place. Management can thwart this tendency through positive actions, such as greater decentralization and more freedom and protection for innovators. Demonstrating belief in people by pushing responsibility to the lowest levels of an organization is the best way to tap individual talent and make innovation a reality.

This conference is aimed at sharing experience with initiatives being taken. I am confident that together, we can and will evolve new and innovative management ideas and concepts that will contribute to high quality and productivity.

I would like to call your attention to a recent report by the President's Commission on Industrial Competitiveness. Its findings summarize what we all know: technology is highly mobile. Other nations are applying it more aggressively than we are, along with their financial and human resources, to develop manufacturing expertise. Consequently, our competitors, especially the Pacific rim nations, produce goods that are more attractive in price and quality.

Reflecting our dismal record in productivity, America's standard of living has grown more slowly than that of our trading partners. Since 1960 our 2 percent growth rate is exceeded by Canada, Germany, France, Italy and Japan. We lead only Britain in growth of standard of living and in that case—just barely.

The commission made recommendations in four areas:

- Coordinating international trade policies with a view to giving it more priority attention.
- Increasing the supply of investment capital and reducing its cost for industry to improve its competitive position.
- Developing a more skilled, flexible and motivated work force.
- Creating, applying and protecting new technology.

NASA's influence and purview being what it is, I believe we have opportunities to impact the latter two areas—that of unleashing the talent we have in the work force and that of protecting our technological position. However, I invite you to review the report yourselves and marshal your corporate management to do whatever you can—our national standard of living—indeed, our economic future, could depend on the nature of your response.

There is much work to be done. The message is clear: U.S. organizations cannot continue to do business as they have in the past. Even high technology is not immune and must adapt, adjust and change in order to survive.

Quality performance is our litmus test. We aim to get rid of shoddy workmanship, defective materials, inadequate quality control, cost overruns and all of the other things that are counter-productive and hurt the program.

Clearly, we live at a time when the public has become keenly aware of what the competition can deliver. They have grown impatient with poor quality and with government inaction. It is a time when management and employees can no longer afford to be patient with outmoded procedures and shoddy workmanship.

Thomas Jefferson once put it this way: "Laws and institutions must go hand in hand with the progress of the human mind. . . . as new discoveries are made, new truths disclosed, and manners and opinions change with the change of circumstances, institutions must advance also, and keep pace with the times."

"Institution must advance." Jefferson and his associates saw that point clearly and the fruit of their vision was a new nation.

I am confident that working together we can and will

meet our goals. We can set an example for others to emulate. And when we do, both NASA and nation will be the winners.

Effects of Space on Human System Probed at JPL

Today the greatest challenge of space flight still persists — studying and remedying the effects of weightlessness, particularly during long missions.

Skylab proved that man could live and work in space for extended periods of time. And although biomedical problems persist, the Space Shuttle continues to make space flight seem routine. The advent of the Space Station, however, brings some of the old, nagging problems back to life.

According to Dr. Douglas O'Handley, manager of the JPL Life Sciences program, scientists and medical doctors will learn more about cardiovascular deconditioning, bone demineralization and high energy radiation exposure from solar flares — the effects commonly associated with long-duration space flight — after monitoring and examining astronauts working on the Space Station.

JPL's Life Science program is seeking solutions for biomedical problems associated with the Space Station and the problems which still affect shuttle astronauts.

The lab also is involved in biological research, exploring the application of remote sensing technology to public health issues, and developing wider uses for biomedical technology.

JPL has been involved in life sciences for about 7 years. But the lab's involvement has grown and JPL now specializes in developing medical instruments used in space. Researchers are working to improve non-invasive techniques of examining and monitoring astronauts.

JPL is interested in developing instruments that will enable ground-based doctors to predict, then prevent infectious diseases from spreading while astronauts are in space. The program also is interested in developing instruments that could evaluate the impact of continuous low-level exposure to harmful radiation.

In space, high energy radiation is a serious threat. Flight trajectories have been planned with solar activity in mind, according to O'Handley. "No one really understands the damage radiation will do when it hits cells in the human body," he added.

Solar flares release massive quantities of harmful radiation into space. While astronauts inside the spacecraft are somewhat shielded, astronauts working outside the Shuttle or Space Station would not be adequately protected. And astronauts are exposed to more radiation the longer they are in space, a problem since Space Station astronauts will be scheduled for 90-day missions, with possible repetitive tours of duty.

"Understanding the effects of biological systems is of paramount importance," O'Handley noted.

Another effect of weightlessness is bone demineralization. Astronauts flying on Skylab were observed to progressively lose calcium from their bones and experience other skeletal changes. This effect appears to be the most serious biomedical condition associated with long-duration spaceflight. "There is a lot of evidence that bone demineralization will be a serious problem in the Space Station era," he said.

Recent studies have shown that astronauts' heart volume decreases in a weightless environment. Cardiovascular deconditioning is not thought to be a long-term effect since astronauts studied have recovered within a couple weeks after space flight.

"When you are in space flight, your heart really goes on vacation," O'Handley said.

Other information gathered from recent shuttle flights suggests there is approximately a 10 percent fluid shift in astronauts' legs. This decrease of blood volume might represent the body's adaptation to space — but doctors must further investigate the phenomenon to understand it.

Frequently, astronauts have dealt with motion sickness while NASA searched for a remedy. "The answer is becoming very obvious." O'Handley said. "Space motion sickness is just a fact of space flight and we have to develop drugs to accommodate its effects."

In addition to studying the biological effects of spaceflight, NASA Life Sciences is also concerned with in-flight health care and emergency medicine — such as treating injuries that might occur while astronauts are working in space.

The Europeans also are very interested in space medicine. "It is very clear that Europe feels they can make a valuable contribution to the life sciences," O'Handley said, mentioning there are many top-notch doctors in Europe specializing in space medicine.

O'Handley has initiated several international cooperative ventures for NASA Life Sciences and was recently elected a fellow of England's Royal Society of Medicine. O'Handley views his appointment as a reflection of Europe's excitement to become more involved in space medicine.

"Foreign organizations can make significant contributions and play a major role in the space

program, especially during the Space Station era," he said.

The technology developed for the Space Station will not only benefit astronauts working on the project, but the spinoffs will also help people on Earth and perhaps future astronauts working on the lunar base project or even a manned mission to Mars.

Satellite Helps Rescue Vietnam Vet at Sea

A sailor trying to raise funds for a Vietnam Memorial, recently, almost lost his life in the effort. Thanks to COSPAS/SARSAT, an international satellite rescue system, he lived and saw the dedication of the memorial in New York.

Jack Boye departed Miami on April 27 and was due to sail into the New York harbor sometime before the May 7 dedication of a memorial to Vietnam Veterans of Airborne 173, his wartime squadron. He was piloting Dear America, a sloop christened after a book about one man's journey through Vietnam.

Three days into the voyage, the sloop's radio failed and his troubles began. Without a radio, he did not know that what appeared to be a rainstorm actually was a dangerous low pressure system.

"The waves built up to 25 feet with 60-mile-per-hour winds," he explained. "The rigging failed and I laid ahull (afloat but adrift) at the mercy of the sea."

The storm caused the sloop's electrical and electronic equipment and engine to fail, and Dear America capsized several times. Just before dawn on May 5, the boat "completely rolled over," Boye said, and he could no longer keep the vessel from filling with water.

At that point, Boye activated a radio beacon to alert search and rescue authorities of his predicament. Boye trailed an Emergency Position-Indicating Radio Beacon off the stern of the sloop and waited for authorities to find him.

"When I saw the test signal work, I knew someone would receive the signal," he said. "It gave me the strength to keep going." He had been 3 days without sleep and 2 days without food.

An orbiting search and rescue satellite, one of two U.S. and three Soviet satellites equipped with search and rescue equipment, first received the distress signal and beamed it to the Rescue and Command Center at Scott Air Force Base, Ill., where authorities alerted rescue forces. The COSPAS/SARSAT system is an international program carried out by Canada, France, the Soviet Union and the United States as major partners.

After an electronic search for the distress signal, a Coast Guard aircraft located the sloop about 140 miles off Cape Henry, Va. According to Coast Guard officials, Boye appeared to be in no immediate danger and fired two signal flares as the rescue aircraft approached.

At that time, the Coast Guard requested assistance from a naval ship in the vicinity. The USS Detroit sent a whaleboat with the ship's doctor to Boye's rescue and remained on the scene until the arrival of the Coast Guard cutter Bear. The Coast Guard cutter Point Arena relieved the Bear and towed Dear America into Portsmouth.

The commanding officer of Point Arena, Lt. Stephen Flynn said "If Boye had not activated the radio beacon when he did, authorities might have taken several days to realize that he was overdue and locate the missing vessel."

Boye, who lives in Princeton, N.J., calls himself SARSAT's "hardiest and most thankful user."

"Anybody who goes off shore should carry a transmitter as a safety precaution," he said. "I carry two, one on the life raft and one mounted in the boat. I wouldn't go off shore if this rescue system wasn't in effect."

To date, the COSPAS/SARSAT system has been instrumental in the rescue of more than 400 persons. The United States effort is managed by the National Oceanic and Atmospheric Administration. NASA's Goddard Space Flight Center in Greenbelt, Md., is responsible for the research and development.

Teacher In Space Announced

Vice President Bush recently announced from the White House that Sharon Christa McAuliffe will be the teacher to go into space aboard the Space Shuttle next January.

McAuliffe, who prefers to be called Christa, is a social studies teacher at Concord High School, Concord, N.H. She is the finalist in the NASA Teacher in Space Project announced by President Reagan in August 1984. Her back-up will be Barbara R. Morgan of McCall-Donnelly Elementary School, McCall, Idaho.

The eight other teachers who reached final competition accompanied McAuliffe and Morgan to the White House.

The 10 project finalists, selected from 114 elementary and secondary school teachers, were announced on July 1 and reported to NASA's Johnson Space Center, Houston, on July 7 for medical examinations and space flight suitability testing. Beginning July 15, the teachers were interviewed by the NASA Space Flight Participant Committee in Washington, D.C.

The committee then submitted the results of the physical examinations and interviews to NASA Administrator James M. Beggs who made the final selection.

McAuliffe has proposed that while in space she would gather information for a personal journal. "My journal would be a trilogy. I would like to begin it at the point of selection through the training for the program. The second part would cover the actual flight. Part three would cover my thoughts and reactions after my return," McAuliffe said.

After the flight, McAuliffe has expressed her desire to share her experiences with educators. She said, "As an educational conference speaker, I would share my space flight experiences through a slide or video tape presentation and lecture. As a presenter in the workshop format, I would have the opportunity to meet with small groups of educators from different disciplines and give them suggestions for class projects and activities."

Commercially Developing Space

NASA has signed an agreement with Instrument Technology Associates (ITA), Exton, Pa. to develop flight hardware consisting of a Standardized Experiment Module (ISEM) payload carrier for use aboard the Space Shuttle.

The ISEM will be an experiment module that customers can use as a "turn key" operation. Any commercial firm, government agency, research organization or educational institution that wishes to conduct experiments in a microgravity environment on Shuttle flights can do so by purchasing or leasing all or part of the ISEM.

Isaac T. Gillam IV, Assistant Administrator of the NASA Headquarter's Office of Commercial Programs, said "The signing of this agreement moves us one step closer to our goal of commercially developing space."

Under the agreement, NASA will provide ITA with two Shuttle flights to obtain data and validate the design of the ISEM. The first ISEM test scheduled for late 1987, will carry a payload for the Bioprocessing and Pharmaceutical Center of the Philadelphia University City Science Center.

The ISEM will be designed to be compatible with the Space Station and it is envisioned that initial users of the module will progress to larger and more sophisticated payloads that will ultimately fly aboard the station.

First Space-Made Products Sold

NASA and the National Bureau of Standards (NBS) have collaborated on the first sales of a product manufactured in space.

"This material is the first of what we expect will be a long line of products to carry a made-in-space label," said James M. Beggs, NASA Administrator.

They will be used to improve microscopic measurements made throughout the economy in electronics, medicine and other high technology areas.

The space product, which measures 10 micrometers (1/2500th of an inch) in diameter, is being purchased by producers of finely ground powder products such as paint pigments, inks, toners, chemicals, flour and cosmetics as well as by technologists who monitor environmental particulate pollution from industrial and chemical plants.

The spheres also will be used by medical researchers who calibrate instruments to count blood cells and measure their shape and to perform a wide variety of diagnostic measurements. Moreover, the product is available to manufacturers as a reference in producing and distributing secondary measurement standards.

The billions of spheres were produced aboard several Space Shuttle flights using a chemical process developed for NASA by Lehigh University.

The spheres were produced in space because earthbound processes have not yielded sufficiently uniform materials in usable quantities. When produced in a low-gravity environment, the polystyrene spheres grow uniformly in size and shape.

The space material has been packaged by NBS into approximately 600 Standard Reference Material units. Each unit is a 5-milliliter vial that contains approximately 30 million spheres. They are in a 0.4 percent concentration by weight; the remainder is water.

The price of Standard Reference Material 1960 (30 million spheres) is $384 per unit. Proceeds from the sales are shared equally by NASA and NBS.

Inside NASA

NASA Facility Improved to Extend Landing Dynamics Research

NASA wasted no time resuming use of its improved Aircraft Landing Dynamics Facility. The first test program to use this higher-speed, simulated landing track has begun with a study related to the Space Shuttle main landing gear.

Located at NASA's Langley Research Center, the 29-year-old facility was fully modernized in a 2½ year effort costing $15 million.

The facility has literally gone to new lengths to test advanced technologies for safer, more economical, all-weather aircraft ground operations. The track, used to test aircraft wheels, tires and landing gear, has been stretched more than ½ mile in length. This and related improvements have increased the facility's maximum test speed from 120 to 250 mph and makes possible, for the first time, practical landing tests of all modern aircraft and the Space Shuttle.

The facility uses a high-pressure (3,150 psi) water jet system to propel the test carriage along the rail/track system where experiments are conducted under simulated runway conditions. Even before the expansion, it was believed to be the only facility in the world capable of testing full-size aircraft landing gear systems under closely controlled conditions simulating takeoffs and landings.

The first research on the modified facility is studying the cornering forces and spin-up characteristics of the Space Shuttle main gear tire. A tire-wheel-brake assembly is mounted on the carriage for tests of tire wear and applied loads. Shuttle tires "spin up" from zero to landing speeds almost instantly at touchdown.

The first tests were run on the facility's existing smooth concrete surface. Later runs require the "touchdown" area of the track to be changed to simulate the roughness and grooving of the shuttle runway at the Kennedy Space Center, Fla. This relatively rough runway then will be painted smooth again — all to determine the best Kennedy runway characteristics to lessen shuttle tire wear.

Testing options at the Langley track include choosing between concrete or asphalt runway surfaces and from a full range of weather-related surface conditions. Dry, damp or flooded runways can be simulated and slush and ice surfaces can be created.

Facility improvements include a higher capacity water jet system and a newly designed high-speed test carriage. The improved catapult system produces a 1.7-million-pound thrust on the carriage, resulting in a 17-g (gravity force) acceleration that pushes the carriage from 0 to 250 mph in 2 seconds in only 400 feet. The new carriage has a 20-by-40-foot test bay to accommodate larger test articles. Ten thousand gallons of water are used in a maximum speed run.

A wide variety of aircraft landing hardware, averaging about 75 to 100 runs each, will follow the shuttle tests. An estimated 300 runs can be accomplished each year, with as many as half a dozen taking place on 1 day during the height of a test program.

One test program, for example, will take a close look at radial tires, which are not commonly used on aircraft. The NASA facility will test the tires for aircraft landing gear, comparing their performance with that of conventional bias ply tires. To make the best use of the facility, these tests will be run in conjunction with a Federal Aviation Administration/NASA program to gather information about runway surface traction.

Other test programs scheduled in the next several years include track tests to develop a data base for the National Tire Modeling Program, an analytical computer model to aid in the design of new tires, and a tire failure study.

STS Manager Named, Organization Streamlined

NASA announced the appointment of Arnold D. Aldrich as Manager of the National Space Transportation System (NSTS). Aldrich, a 26-year NASA veteran and head of the Space Shuttle Projects Office at the Johnson Space Center, fills the vacancy left when Glynn S. Lunney retired in April.

The Level II NSTS organization at JSC will assimilate the Projects Office, consolidating all program elements under Aldrich's direction. Richard H. Kohrs, who has been acting program manager, and Lt. Col. Thomas W. Redmond, USAF, have been named Deputy Managers.

In a related move, Thomas E. Utsman, head of Shuttle Management and Operations at the Kennedy Space Center, will become Deputy Director of KSC. Shuttle Management and Operations will be divided into

two primary organizations: Shuttle Engineering and Shuttle Operations.

The functions of the Engineering Directorate, headed by Horace L. Lamberth, will be expanded to include skills necessary for sustaining engineering of the Orbiter.

The Operations Directorate, headed by Robert B. Sieck, will retain all functions necessary to manage the day-to-day shuttle processing and its logical support.

Launch Support Services and Orbiter Thermal Protection System manufacturing contracts, functions closely associated with KSC responsibilities for Shuttle maintenance and launch preparation, will be transferred from JSC to KSC later this year. At the beginning of 1986, KSC also will take over logistics responsibility for spare parts refurbishment and procurement, and will begin assuming sustaining engineering responsibility for Orbiter subsystems.

The moves are an administrative realignment reflecting the maturation of the Shuttle program. Staffing levels at the two centers will not be affected by the new organizational structure. All changes were effective August 12.

With the combined responsibility, Aldrich takes charge of integration of all Space Shuttle Program elements including flight software, Orbiter, external tank, solid rocket boosters, main engines, payloads, payload carriers and Shuttle facilities. Responsibilities also include directing and planning for NSTS operations and for management of Orbiter and government furnished equipment projects.

Prototype Acquisition Management System Developed

A core acquisition management system, from which all NASA centers will soon benefit, has been developed by the Langley Research Center.

The agency has had various studies conducted over the past 10 years to consider standardizing certain procurement functions. Following these studies, a decision was made in 1980 by NASA Headquarters to initiate the Procurement Management Technology Program (PMTP). Each center was requested to have a procurement specialist and an automated data processing specialist to serve as members of the Inter-Center Management Team (ICMT) group for developing and implementing this program.

In 1984, Langley was named lead center to develop portions of a procurement system for the agency. This decision was reached as a result of a 3-day workshop held at Langley to determine the feasibility of using Langley's computerized acquisition system as the baseline for the NASA-wide system.

Based on a unanimous decision of the ICMT to adopt Langley's system, Langley was requested to provide five modules as a baseline to the program: bidders sources, purchase request tracking, contract award information, contract administration and contract closeout.

The agency's Automation Information Management System (AIMS) council authorized funding and gave project approval.

Langley's application system software was converted from COBAL programming language to NATURAL using "ADABAS," which is the "adaptable data base management system," as the data base management system. The conversion conformed to the configuration of the NASA standard system as set forth by the NASA Administrator. COBOL was not considered part of the standard system, as was NATURAL.

The team also incorporated the necessary legislative changes — those applicable to the Headquarters reporting requirements — resulting in the "Competition in Contracting Act" passed by the 98th Congress. Other enhancements included the capability to generate purchase request milestones automatically as well as other center-unique requirements.

The five modules are being installed on NASA Headquarters computers. The core system will be implemented at the centers in 1986-87. NASA Headquarters is working with a contractor to include the procurement regulations and document generation modules as part of the initial PMTP package.

Members of Langley's project team appointed to develop a NASA-wide core acquisition management system are (front row) Vernon Vann, deputy project manager; Richard H. Jones, project manager; Jenny Craft, programmer anlayst from Kentron; Chuck Brown, programmer, Kentron; Laurie Cole, secretary; (back row) Don Avery and Bill Rew, procurement analysts; Terry Hahm, programmer analyst and consultant; and Gene Browning and Brian Smith, programmers, Kentron.

From The Chief Engineer

. . . Milton A. Silveira

We are now entering a period of competition. We are now seeing competition come from many new areas. Previously our sole competition came from the Soviets, and really had more to do with national pride. Now we are seeing economic competition not only in aircraft but also in space. With the continuing development of the "Third World" nations, still additional competition is in store. Where we were once responsible for nearly all of the high technology new development, it is forecast that soon we will be responsible for less than half. Where we once dominated the commercial aircraft world-wide market, we are seeing U.S. airlines now buying large aircraft from overseas. The competition from the Ariane for spacecraft launches is well known and has already taken a large part of the commercial spacecraft business from the Space Shuttle. We must be prepared to meet this increased competition.

As always, the complexion of the NASA agency continues to change. The Space Shuttle and the integration of payloads into the vehicle has required that we become more uniform in our requirements as far as testing and analysis are concerned. When we found one center supplying instruments for another center's spacecraft to fly on the Shuttle and that three different requirements were being used, it was necessary to develop an agency fracture control method. As our requirement for space hardware continues to grow and the industry works with more than a single NASA center, we must look more like an agency rather than as individual centers. When one standard is accepted at one center, it also must be accepted at another center. We are attempting to develop agency standards where it will make our job easier, but on the other hand, not hinder the flexibility required to continue to do more with fewer resources. We must resist becoming rigid. We must continue thinking and finding better ways to do business.

The Administrator as well as the President have put great emphasis on the need to increase productivity. If we are to compete and meet the challenge of competition from our friends overseas, we must become more efficient. We must motivate our people and ourselves to accomplish more with less effort, to be more productive. We enjoy a fine standard of living and are rewarded for our efforts as well as any nation. On the other hand, there are large population groups who are willing to work for less wages to produce the same products. If we are going to maintain our way of life, we must produce the product at the same cost as these nations and therefore, we must advance the technology to use more robotics and artificial intelligence to match the lower-per-hour labor cost. We must look for more ways to automate our efforts to reduce the man hours to produce a task. The computer, in its application to information systems and its coupling to manufacturing process, have already made great changes to our way of life. The continued explanation of its uses is paramount to leadership.

Some of our industries have already seen the effects of overseas competition. Many electronic components are no longer manufactured in the United States. This includes several relatively new devices such as the video tape recorder which was invented here but no longer produced in the United States. The same is true for radio and television assembly. Only through automation and higher productivity are we going to get back into the market place.

Another factor is the quality of our product. The space program, by its basic nature, has driven the requirement for high quality. We have sometimes been criticized for our demands, but it has been necessary. NASA has become a leader in the demand for high quality. Industry has found out the hard way what happens if you continue to produce a poor quality product. Our results in the space program from a part that fails because of poor quality can have a far more serious consequence. Again the White House has made a serious effort to improve the quality of an American product. It used to be that "Made in USA" was an assurance of a quality product. We must restore the confidence in that marking on a product. NASA must continue and lead in insisting that everyone do the best job possible. The cost of not doing so is expensive.

Over the past 26 years, we have built the finest research and development organization ever known. We must continue to build the agency. We must continue doing all the things which make this organization great. We must allow the good ideas to surface and find a way of using them. We must not become so rigid in our management of the organization that we cannot accomplish the difficult goals we have achieved in the past. We must continue to do the impossible. Our nation depends on it. There is no doubt we can meet the competition and beat these challenges.

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Have Launch Range, Will Travel

A Special 40th Anniversary — You Should Know. . . .

. . . That Goddard Space Flight Center Wallops Flight Facility is the oldest rocket-launching facility in the United States.

. . . That more than 13,000 rockets have been launched by Wallops personnel from NASA's Wallops Island, Va., facility and other sites around the world.

. . . That 19 satellites—including British, Italian and French spacecraft—have been orbited from Wallops.

. . . That the trail-blazer vehicle, used to study reentry physics, set a speed record of 38,000 miles per hour at Wallops on May 6, 1962.

. . . That Wallops recently celebrated its 40th anniversary of the first rocket launch—a Tiamat.

. . . That Wallops has a mobile launch range which can move to almost any part of the world—South America, Europe, Greenland or an ocean-going aircraft carrier—to launch rocketborne scientific experiments to study the near-Earth environment.

A unique capability for suborbital research exists at Goddard's Wallops Flight Facility. The rocket range facilities, research airport and aircraft, data acquisition systems, proximity to the ocean and personnel skills in experimental missions provide the facility with a special capability.

Accordingly, the management of NASA's Sounding Rocket and Balloon Programs is conducted from this facility. More than 200 rockets, ranging in size from small meteorological rockets through the orbital Scout launch vehicle, are launched annually from Wallops and remote sites all over the world. Most of the large balloon flights are conducted from the National Scientific Balloon Facility at Palestine, Texas.

The sounding rockets, balloons and aircraft provide the center with simple, flexible and inexpensive methods of conducting scientific investigations. Scientific data can be obtained from sites widely dispersed at various altitudes. These platforms provide a means of testing new instrumentation intended for future space missions.

Many other important scientific achievements have taken place at this Eastern Shore facility.

. . . The breakthroughs to supersonic flight by aircraft and to hypersonic flight by rocket systems were attributed largely to fundamental aerodynamic research conducted at Wallops by aerodynamic models propelled by multiple-stage rocket systems.

. . . Technologies for measuring atmospheric structure and the space environment, such as temperature, pressure and density, and micrometeorite densities, electric fields, energetic particles and radiation levels, were developed on sounding rockets and formed the basis for developing design criteria for scientific satellites and manned spacecraft.

Watching one of the model rocket launches are part of the more than 3,000 people who attended the Wallops' 40th Anniversary Celebration and Open House. In the background are NASA and Navy aircraft on display.

. . . The first satellite launched by a solid-propellant vehicle (Explorer IX) was orbited from Wallops on Feb. 16, 1961.

. . . Two male bullfrogs were orbited onboard a Scout vehicle Oct. 2, 1970, to learn more about the adaptability of the vestibule in the inner ear (which controls balance) in a sustained weightless environment as well as its response to acceleration—called the Orbiting Frog Otolith.

. . . One of the earliest "astronauts," Sam, the rhesus monkey, was launched from Wallops on Dec. 4, 1959, in a Mercury spacecraft that went 55 miles into space and was recovered safely. This flight was part of a test series to check the recovery, life-support and escape systems before Alan Shepard took his first suborbital flight.

. . . During 1967, 1968 and 1969, white rats in 300-pound payloads were launched on Aerobee 150As to study their behavior in an artificial gravity field.

. . . The first completely automated helicopter landing was achieved at Wallops airport Feb. 10, 1972.

. . . Today's grooved highways are, in part, the result of traction research conducted on Wallops runways.

. . . In 1967, Wallops began regular ozone measurements that have continued to present (longest record available anywhere).

Happy 40th.

Heard From Around the World

(from non-NASA sources)

China — U.S. scientist Taylor Wang gave a vivid and entertaining report on his recent mission aboard a U.S. Space Shuttle to Beijing scientists at a welcoming meeting held by the Chinese Astronautics Industry Minister.

The audience gave a long, standing ovation to the first space traveller of Chinese origin when Wang entered the hall. Wang was born in China and attended primary school in Shanghai.

Ministry Vice-Minister Bao Keming congratulated Wang on his successful space mission and recalled the visit by two American astronauts, Jack Lousma and Gordon Fullerton, 2 years earlier.

He said that China's open policy in recent years has given great impetus to the development of space technology, and that China has formed close ties and cooperation with more than 40 countries and regions in the development of space science and technology.

Bao expressed confidence that Wang's visit would further promote the friendship and cooperation between scientists of the two countries and that Sino-American space science and technology collaboration and exchanges are promising.

Europe — Professor Reimar Lust, director general of the European Space Agency, told a Tass correspondent that "My dream, that extends as far as the threshold of the 21st century, is a scientific space project which would combine the huge scientific and technical potential of the USSR, the USA, Japan, and the European Space Agency. But with good will, it is possible to discuss much earlier concrete ways of cooperation in research with the use of manned spacecraft and orbital stations."

Japan — The Japanese National Space Development Agency (NASDA) conducted ground tests of the first H-1 rocket, being developed to place large communications satellites into geostationary orbit.

The H-1 will replace the N-11 rocket now used to launch broadcast satellites. The three-stage H-1 can launch a 550-kilogram satellite.

The completed tests checked the functions of the second and third stage rockets and their inertia equipment as well as ground equipment.

Space Shuttle To Launch Maritime Satellites

The NASA Space Shuttle has been selected by the International Maritime Satellite Organization (INMARSAT) to launch two communications satellites in INMARSAT's second generation series. Launches are slated for July 1988 and mid-1989.

The launch of these spacecraft will enhance INMARSAT's existing maritime satellite network and the communications services it provides to 43-member nations, including the United States.

The INMARSAT spacecraft will be built by British Aerospace Corporation with Hughes Aircraft supplying the spacecraft communications payload. A McDonnell Douglas spin-stabilized upper stage, the PAM-D, will boost the spacecraft from low-Earth orbit into a geosynchronous transfer orbit. An apogee kick motor, a smaller rocket motor on the spacecraft, then will position the spacecraft in a circular 22,300 nautical mile geosynchronous orbit.

Did You Know?

Major aerospace companies and the Department of Health and Human Services have volunteered their resources to jointly design technology into tools to help the severely disabled. The plan would allow the disabled to call a toll-free number and describe their problem to the aerospace engineers who, in turn, would design a custom-made solution. The program will be implemented gradually around the country with toll-free numbers available nationwide by the end of 1988. The companies would volunteer all their time and materials and will not cost either the handicapped or the government anything.

An ice cream store in Olympia, Wash., is establishing a trust fund to send the first U.S. child into space. The fund was designed for the sole purpose of paying for all or part of the expenses and will commence with a fundraiser featuring an attempt to create a 3-mile-long banana split. The trust fund, established in a bank in Lacey, Wash., will be made available to either NASA or a private carrier.

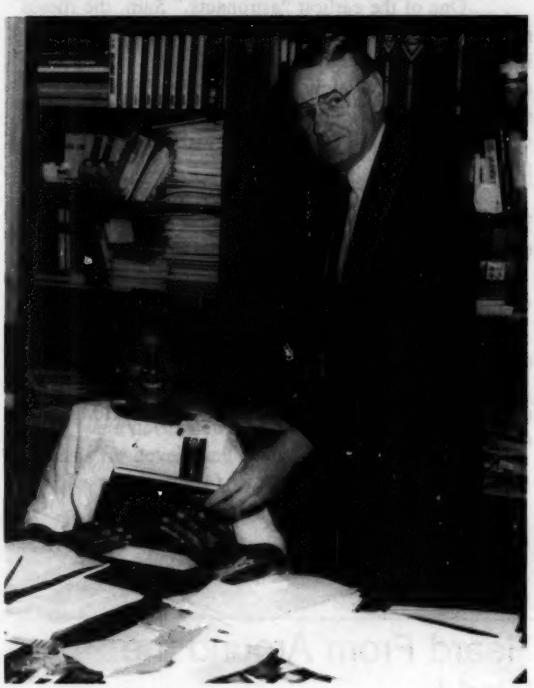
To honor **Langley Research Center NASA Employee Teams,** (NETs), an awareness and recognition program was held by the Center. Richard H. Petersen, center director, addressed the 130 staff members attending the program.

Comments also were made by Bob Swain, assistant director for systems engineering and operations and chairman of the Langley NETs Steering Committee; "Skippy" Cole, NETs facilitator; and Bill Williams, special assistant for productivity improvement.

Accomplishments by the 17 NETs include devising a maintenance scheduling system for center portable electronic equipment to insure routine calibration; development of an adapter for copying machines, permitting use of 2,000-foot, rather than 500-foot, paper supplies; and a joint NASA-contractor method for cleaning parts with Freon, rather than with alcohol, preserving part identification numbers, reducing storage problems and eliminating associated fire hazards.

A NASA aeronautics fire safety technology advance is being included in all civil, general aviation and helicopter aircraft. A new FAA regulation requires the fire-blocking cloth layer to cover seat bottom cushions, the back cushions, the headrests and side arms. This technology has potential application to couches and mattresses in the home as well. Ames Research Center researchers John Parker and Demetrius Kourtides each received cash awards and the NASA Space Act Award for this technology advancement.

Want to be Acting Administrator? Susan Bogguess, a native of Port Byron, Ill., was selected to be acting NASA Administrator for 2 days. The program, funded and operated by the American Legion Auxiliary, entitled Girls State and Girls Nation, is a youth citizenship training program conducted annually to give high school juniors practical experience in the processes of government and thus, a clearer understanding of their approaching citizenship responsibilities.



Contractor News

The **Martin Marietta Michoud Division** received the National Safety Council's highest award — the Award of Honor.

Earl McNail, Manager of Safety, said "I accept this award on behalf of the nearly 5000 Martin Marietta employees who earned it working at the NASA Michoud Assembly Facility. The safety of the astronauts and the image of the nation are on the line every time a Space Shuttle is launched, and our people are keenly aware of this fact."

The division received the award for achieving 7,209,821 work hours from August 11, 1984 until April 15, 1985 without an injury resulting in a lost work day.

According to McNail, division employees will surpass the best safety record in the aerospace industry, which they established in January 1982, if they complete 1985 without an injury resulting in a lost work day. "At Michoud," McNail said, "safety and pride have become known as keys to mission success."

NASA Lewis Research Center has awarded a $10,169,016 contract to the **General Dynamics Corporation, Convair Division,** San Diego, for management and engineering services in support of the Atlas/Centaur launch vehicles program.

In addition to providing the overall program management and administrative and engineering support, it will include technical management; engineering design, analysis and development; engineering test and development and reliability and quality assurance.

1985 Shuttle Launch Schedule

Mission	Date/Orbiter	Payloads	Crews
51-J	Oct. 3, 1985 *Atlantis*	DOD	Bobko, CDR Grabe, PLT Hilmers, MS Stewart, MS Mullane, MS
61-A	Oct. 30, 1985 *Challenger*	Spacelab-D1	Hartsfield, CDR Nagel, PLT Buchli, MS Bluford, MS Dunbar, MS Furrer, PS (DFVLR) Messerschmid, PS (DFVLR) Ockels, PS (ESA)
61-B	Nov. 27, 1985 *Atlantis*	Morelos-B Satcom KU-1 Aussat-2 CFES	Shaw, CDR O'Connor, PLT Cleave, MS Spring, MS Ross, MS Vela, PS (Mex.) McDonnell Douglas PS
61-C	Dec. 20, 1985 *Columbia*	MSL-3 Satcom KU-2 Syncom IV-5	Gibson, CDR Bolden, PLT Chang-Diaz, MS Hawley, MS Nelson, MS RCA PS

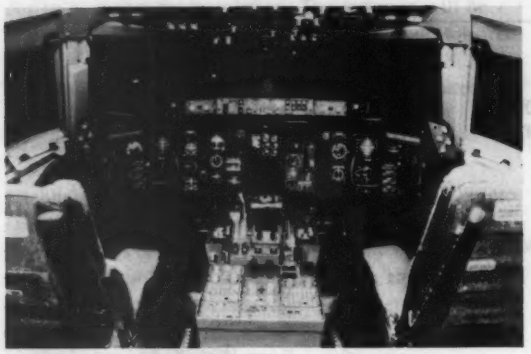
1985 Expendable Launch Schedule

Mission	Launch Date	Vehicle	Launch Site
Intelsat VA-D	Sept. 26	Atlas Centaur	ESMC
AF-16	Sept.	Scout	WFF
AF-17	Oct.-Dec.	Scout	WFF
NOAA-G	Nov.	Atlas	WSMC
GOES-G	Dec.	Delta	ESMC
Navy-23	Dec.	Scout	WSMC

* **Launch Sites:** KSC — Kennedy Space Center, Fla.; ESMC — Eastern Space and Missile Center, Fla.; SMR — San Marco Range, Indian Ocean; WSMC — Western Space and Missile Center, Vandenberg Air Force Base, Calif.; WFF — Wallops Flight Facility, Wallops Island, Va.

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans — and at a tiny percentage of the tax dollar. Here is an example:



Jetliner Alert Systems

For years, jetliner cockpits have been getting more complicated, due to more complex on-board systems and increasing regulatory requirements. This is particularly true of systems that alert crews to malfunctions or other hazards and American manufacturers are taking steps to halt that trend. The newest transports, including the Boeing 757 and 767 (lower right) and the McDonnell Douglas DC-9 Super 80, incorporate technology designed to reduce the complexity of crew alerting systems. Several years of research and design verification, by aircraft manufacturers, the Federal Aviation Administration and NASA, preceded the introduction to service of these jetliners.

Shown above is the flight deck of the Boeing 757, in the exact center of which is the primary display panel for the Engine Indication and Crew Alerting System (EICAS). The EICAS system automatically monitors more than 400 inputs from sensors and provides three levels of alert messages: warning, when a condition requires immediate crew action; caution, when immediate crew awareness and future action is required; and advisory, for conditions that require crew awareness and possible future action. Written messages appear on the EICAS displays in different colors, according to alert category: red for warning, amber for caution and advisory. Aural alerts on the 757 are signaled by bells, sirens, caution beepers and, in some cases, synthetic voice messages. The 757 employs voice alerts only for ground proximity messages and relies on the centralized visual displays for most alerts. The DC-9 Super 80 features expanded use of voice alerts. Generally, advanced systems like EICAS are designed to reduce alert ambiguity, to order alerts by priority and to put visual displays where they are best viewed by both pilots to assure earliest awareness.

Almost a decade ago, Ames Research Center pioneered research in cockpit applications for computer-controlled voice synthesizers capable of constructing messages from basic speech sounds. To help pilots monitor several flight parameters during difficult landing approaches, Ames developed experimental systems for synthesized voice readout of altitude, airspeed, descent rate and deviation from flight path. Concurrently, Ames was researching the human factors associated with crew alert systems, such as defining the pilots' field of view to aid placement of visual displays, study of flight deck background noise that might interfere with aural alerts, and other considerations of the most effective ways to advise crews of problems. Ames expertise was made available to aircraft manufacturers, providing contributions in synthetic voice alert criteria and human factors guidelines for alert systems in general.

* NASA does not endorse commercial products developed as a result of its Technology Utilization or Patent Licensing Programs, but it does encourage the widest possible use of its technology.

*U.S. GOVERNMENT PRINTING OFFICE: 1985- 461-600:20002